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Standardization in Gunshot Residue Analysis by Scanning Electron Microscopy/Energy-Dispersive Spectroscopy

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- ***NEW* GSR Surface Kit**

The ASTM committee is currently in the process of updating the current Guide 1588-95 "Standard Guide for Gunshot Residue Analysis by Scanning Electron Microscopy/ Energy Dispersive Spectroscopy" *[1]*. We feel this warrants a few comments about the standardization of the GSR analysis by SEM/EDX.

On one hand, it seems important to underline certain aspects of some basic terminology and definitions used by the experts. On the other hand, the standardization of the analytical procedures seems worthy of discussions.

1) Given that a definition is a "statement of meaning" *[2]*, gunshot residue is not the only definition adopted. Instead of GSR, some articles make reference to other definitions, such as cartridge discharge residue (CDR) *[3]*, firearm discharge residue (FDR) *[4]*, primer discharge residue (PDR) *[5]*, potential firearm discharge residue (P-FDR) or Full GSR *[6]*. Moreover particles with the same composition are defined differently by different authors:

Wolten *et al.* define them "characteristic" or "consistent" *[7]* .

Wallace and McQuillan define them "unique" or "indicative" *[3]*.

The lack of "standardized" definitions may be misleading, resulting in discussions within the context of disputed cases. A standardized procedure also needs a common definition of the object of the analysis. In this respect, I am in favor of the adoption of common definitions elaborated by the ASTM committee and based on a widespread acceptance. My suggestion for the updated version of the "Standard Guide for Gunshot Residue Analysis by Scanning Electron Microscopy/Energy Dispersive Spectroscopy" is to adopt clear "statement of meaning" such as:

- A **unique GSR** particle is a particle whose only known source is the explosion of a primer.
- A **not-unique GSR** particle is a particle whose possible source is the explosion of a primer.

2) In the context of the standardization of the analytical procedures, it is worth examining all the aspects of the detection and identification of GSR, keeping in mind that guidelines may be more useful than strict procedures. A complete procedure for GSR detection and identification includes:

The collection method from different surfaces, the sample preparation, the analysis, the classification scheme and the report to the Court.

In my opinion, guidelines are the sole means flexible enough to encompass the wide range of different situations arising in different countries in real cases.

To determine whether a particle comes from the explosion of a primer or from other possible sources, the most important aspect of the procedure is the classification scheme, i.e. the rules of a formal general interpretative system.

The classification scheme results from the following: the list of the unique composition, the list of "permitted" elements and the weight of morphology in the interpretation. The literature mentions three elemental compositions of the so called "unique" GSR particles:

- Pb_Sb_Ba *[3]*,
- Sb_Ba *[3]*,
- Pb_Ba_Ca_Si_Sn *[8]*.

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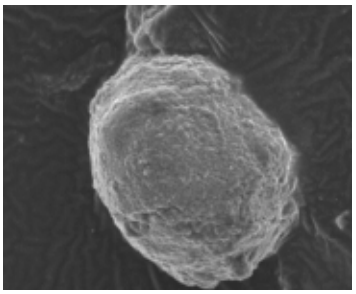
Standardisation in Gunshot Residue Analysis... *Continued*



Lead and Barium
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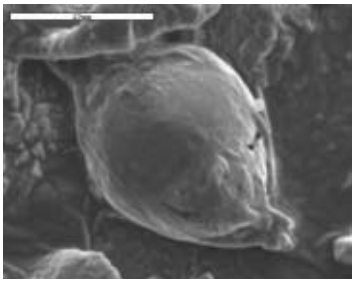
Science is the great antidote to the poison of enthusiasm and superstition.

Adam Smith (1723-90) Scottish economist. The Wealth of Nations, 1776



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Compositions from lead-free primers like spherical Ti_Zn particles *[9]* may well be included within this list.

A list of "permitted" elements precluding firearm origination is reported in the current Guide 1588-95. One or several of the following and only the following elements may also be present:
Si, Ca, Al, Cu, Fe, S, P (rare), Zn (only if Cu is also present), Ni (rare and only with Cu and Zn), K and Cl.

The list should be modified as to comply with the one proposed by Wallace and McQuillan *[3]*. Significant problems arise from the "GSR-similar particles" produced by pyrotechnic devices and by vehicle brakes. In the first case, the presence of Cl, Cu and Mg should be carefully taken into account *[10-11]*. In the second case the presence of Fe may suggest to rule out a particle as a GSR *[11-13]*.

> *Further, the particle(s) found on a specific surface should be compared with those of the crime under investigation whenever possible.*

This case specific or case-by-case approach is closer to what the court is interested in *[14]*. Particles containing elements other than the permitted accompanying elements are classified as inconsistent with firearms discharge unless the relevant element is present in the discharge residue from the gun and/or ammunition used in the crime.

The weight of morphology in the interpretation is maybe the most critical aspect of the classification scheme *[15]*.

The current Guide 1588-95 mentions that a particle having "crystalline morphology… defined shapes with sharp corners…would not be classified as GSR" and ".... morphology...can vary greatly and should therefore be considered only a secondary criterion for identification...". It is desirable in the future to recommend the investigation of the spheroidal shape and/or of the condensate morphology exhibiting molten features and, if necessary, of the distribution of the elements *[16]*: This in order to exclude an origin difference from the cooling of molten material. Surface homogeneity is more important than morphology to rule out particles produced by aggregation.

References

[1] B. MacCrehan, J.A. Buscaglia, New ASTM standard guide for gunshot residue analysis by scanning electron microscopy/ energy-dispersive spectroscopy, IAMA Newsletter 2, *2*, (2001) 9.

[2] American Society for Testing and Materials. Standard definitions, 8th ed. Philadelphia: ASTM, 1994.

[3] J.S. Wallace, J. McQuillan, Discharge residues from cartridge-operated industrial tools, J. Forens. Sci. Soc. 24 (1984) 495-508.

[4] J. Flynn, M. Stoilovic, C. Lennard, I. Prior, H. Kobus, Evaluation of x-ray microfluorescence spectrometry for the elemental analysis of firearms discharge residues, Forensic Sci. Int. 97 (1998) 21-36.

[5] P. Bergman, E. Springer, N. Levin, Hand grenades and primer discharge residues, J. Forens. Sci. 36 (1991) 1044-1052.

[6] J. Lebiedzik, D.L. Johnson, Rapid search and quantitative analysis of gunshot residue particles in the SEM, J. Forens. Sci. 45 (2000) 83-92.

[7] G.M. Wolten, R.S. Nesbitt, A.R. Calloway, G.L. Loper, P.F. Jones, Particle analysis for the detection of gunshot residue. I: Scanning electron microscopy/ energy dispersive X-ray characterization of hand deposits from firing, J. Forens. Sci. 24 (1979) 409-422.

[8] A. Zeichner, N. Levin, More on the uniqueness of gunshot residue (GSR) particles, J. Forens. Sci. 42 (1997) 1027-1028.

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Standardisation in Gunshot Residue Analysis... *Continued*

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[9] N. Levin, T. Tsach, P. Bergman, E. Springer, A survey of titanium and zinc particles in samples collected from suspects, presented at the Second European Academy of Forensic Science Meeting, Cracow, 2000.

[10] P.V. Mosher, M.J. McVicar, E.D. Randall, E.H. Sild, Gunshot residue-similar particles produced by fireworks, Can. Soc. Forens. Sci. J. 31 (1998) 157-168.

[11] J.R. Giacalone, The Aerospace Report refreshed, revisited and reconsidered, IAMA Newsletter 1, *3*, (2000) 5-6.

[12] L. Garofano, M. Capra, F. Ferrari, G. P. Bizzaro, D. Di Tullio, M. Dell'Olio, A. Ghitti, Gunshot residue. Further studies on particles of environmental and occupational origin, Forensic Sci. Int. 103 (1999) 1-21.

[13] C. Torre, G. Mattutino, V. Vasino, Piombo, bario ed antimonio in particelle non correlate a sparo, Zacchia 73 (2000) 137-148.

[14] F.S. Romolo, P. Margot, Identification of gunshot residue: a critical review, Forensic Sci. Int. 119 (2001) 195-211.

[15] D. Kowal, S. Dowell, How do you weight of morphology in the interpretation of your P-GSR results? IAMA Newsletter 2, *2*, (2001) 10.

[16] S. Basu, Deflection modulation imaging of elements in the scanning electron microscope with energy-dispersive X-rays, Journal of Computer Assisted Microscopy 2 (1990) 25-45.

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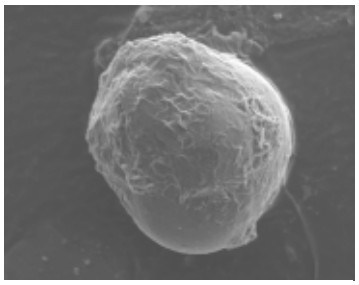

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Science is what you know. Philosophy is what you don't know.

Bertrand Russell (1872-1970) English philosopher, mathematician

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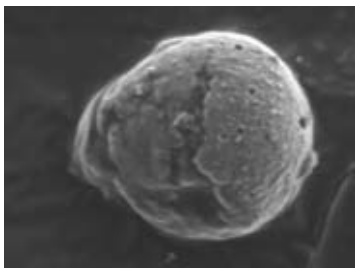

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Forensic Application of an ESEM

ENVIRONMENTAL SCANNING ELECTRON MICROSCOPE (ESEM) has been installed in Forencic Institute in Zagreb, Croatioa in late 1998. Since then extensive experimental work has been conducted.

Classical electron microscope must have a high vacuum (HV) inside its chamber.
ESEM can have a high vacuum of (~10^{-6} Torr) inside its chamber but also can work in low vacuum mode of (~0.1 - 1.00 Torr), or in ESEM mode (1 – 50 Torr).

This allows us to analyse samples of biological origin in their natural state. Samples of biological origin, (garments made of wool, pieces of human tissue, wood, leaves, branches, etc.), can be analysed in ESEM mode in their natural state and without any preparation. Samples of biological origin have high water content. In high vacuum the water freezes so we do not observe samples in its original state. Forensic applications urge for nondestructive and in-vivo analysis so this type of instrument is desirable. Besides that, ESEM has another advantage: samples need not be electrically conductive. With ESEM we can work with electrically conductive samples as well as with electrically nonconductive samples without coating. GSR analysis with classical SEM working in HV can work only with carbon tapes that are electrically conductive and can take away electrical charge. Working with electrically nonconductive tapes is also possible but they have to be coated before inserting in a chamber of the SEM. Charging effects in classical SEM could also be reduced by reducing the high voltage of the electron beam, but this makes EDX analysis more complicated because with low energy primary electron beam it is possible to excite efficiently only L-lines of elements (the beam energy must be roughly two times the energy of line of interest). Excitement of favourable well separated K-lines is possible only with strong energy primary beam (25-30 kV). Classical SEM can not overcome this difficulty. ESEM offers the possibility of EDX analysis of nonconductive samples with any accelerating voltage. GSR analysis on paper, wood, textile, leather and similar material can be performed directly and in its natural state without pretreatment. Forensic application of ESEM in Forensic Institute in Zagreb, Croatia, is divided in two sections: GSR analysis in High Vacuum Mode and GSR analysis in Low Vacuum and ESEM Mode.

GSR ANALYSIS in HIGH VACUUM MODE

GSR analysis in HV was divided in several topics:

- **Comparison of the effectiveness of different taping techniques**: reading related literature one can find information that one has to continue taping the hand even if the tape is no longer sticky: "*It is important to cover the sampled area at least three time even if adhesive has lost its tackiness. The adhesive is quite soft and particles can still be pressed into the surface even if there is no discernable stickiness left" (Handbook of Firearms and Ballistics by Brian J. Heard).* According to our experience this is not true. Adhesive tapes are sticky at the beginning and efficiently collect particles but, unfortunately, after some time they lose their stickiness and collecting of particles is not efficient any more. We use circular carbon adhesive tapes (12.5 mm in diameter) mounted on an aluminum stub. Results of our experimental work shows us that during first 20-30 dabs adhesive tape is still sticky and effectively collects GSR particles. Between 30^{th}-50^{th} dab (press), stickiness of the tape is greatly reduced and effectiveness of collecting particles is greatly reduced. It seems that the tape is not collecting any new GSR particles, but also not losing already collected GSR particles. If we continue after the 50^{th} dab, it seems that adhesive tape has completely lost its stickiness. Not only does the tape not collect any new GSR particles, but the tape starts to lose GSR particles that were already collected on the tape. Al-

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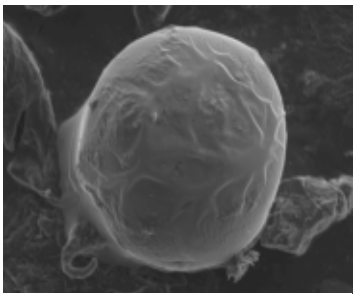

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But are we sure of our observational facts? Scientific men are rather fond of saying pontifically that one ought to be quite sure of one's observational facts before embarking on theory. Fortunately those who give this advice do not practice what they preach. Observation and theory get on best when they are mixed together, both helping one another in the pursuit of truth. It is a good rule not to put overmuch confidence in a theory until it has been confirmed by observation. I hope I shall not shock the experimental physicists too much if I add that it is also a good rule not to put overmuch confidence in the observational results that are put forward until they have been confirmed by theory.

Sir Arthur Stanley Eddington (1882-1944) English astronomer and physicist.

Forensic Application of an ESEM...*Continued*

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though we don't have statistical proof for it, our extensive work in a period of two years led us to the next conclusion:

One adhesive tape (standard carbon double sided tape of 12.5 mm in diameter mounted on an aluminum stub) should be dabbed on a skin of a hand maximum 50 times. If 50 dabs are not enough to cover desired area on a hand, we must continue with another, fresh tape.

In other words, this means that a single adhesive tape can efficiently cover just a fragment of a hand. In order to efficiently cover the whole hand we must use more than one tape. In our experience, optimum will be 5-6 tapes for one hand. On the other hand, this would greatly increase the cost of GSR analysis per one suspect because of need for more tapes. Our experience shows that total time of GSR analysis for increased number of tapes does not necessary increase proportionally. Extra tapes with no GSR particles present will be analyzed in a shorter time than tapes with a high number of GSR particles.

So, in order to compromise, the final conclusion is that the optimal number of tapes per one hand should be between 3 and 4 tapes.

- **Distribution and number of GSR particles on shooter's hands**: one of the most important questions in GSR analysis is the question of distribution of GSR particles on the shooter's hands. To obtain distribution of GSR particles on shooter's hands we performed many shooting tests indoor and outdoor. In order to minimize influence of contamination, prior to shooting, the barrel of a pistol was carefully cleaned and hands washed. We used two pistols in caliber 9x19 mm: "Glock", M-19 and "HS". Ammunition used was "Geco", "PPU", "HP" and "S&B". In this topic, sampling of hands were performed immediately after shooting. According to reasoning from an earlier topic, each hand was taped with 4 tapes. Tape "A" was used to tape the forefinger and middle finger, tape "B" was used to tape a middle of back of the hand (between forefinger and middle finger and a thumb. Tape "C" was used to tape thumb. Tape "D" was used to tape a palm.

  Double-sided carbon adhesive tape of 12.5 mm in diameter mounted on an aluminum stub was used in this experiment to collect particles. Results of the experiment are in agreement with similar experiments elsewhere. The number of unique GSR particles rapidly (exponentially) decrease with

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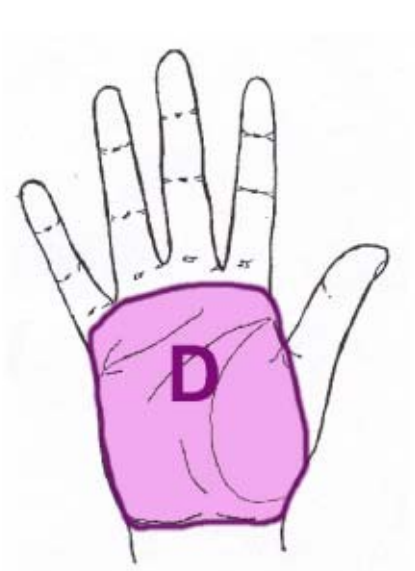

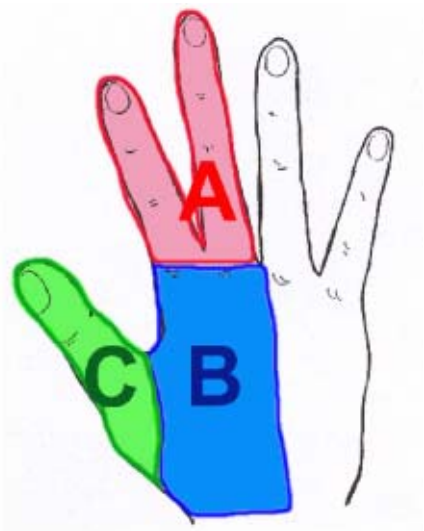

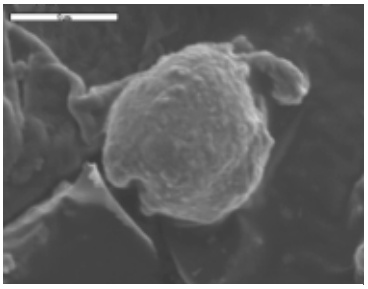

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The mind likes a strange idea as little as the body likes a strange protein and resists it with similar energy. It would not perhaps be too fanciful to say that a new idea is the most quickly acting antigen known to science. If we watch ourselves honestly we shall often find that we have begun to argue against a new idea even before it has been completely stated.

Wilfred Batten Lewis Trotter (1872-1939) English surgeon.

Forensic Application of an ESEM...*Continued*

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time between shooting and sampling hand (taping). Three to four hours after shooting from a 9x19 mm pistol (indoors and outdoors) in ideal conditions (hands were not washed after shooting), there were practically no GSR particles on the shooter's hands. This means that in real casework GSR analysis will be useful for suicides (no GSR particle removal after shooting). In all the other shooting cases where GSR analysis on living subjects is needed (attempted murder, murder, etc.), it is not realistic to expect that police officers will be able to find and sample the suspect within 3 hours maximum. This imposes us to expand our sampling technique and to sample not just hands but also clothing, pockets, face, hair, moustache, beard, eyebrow, nostrils and other, as is common practice in some countries (e.g. GB).

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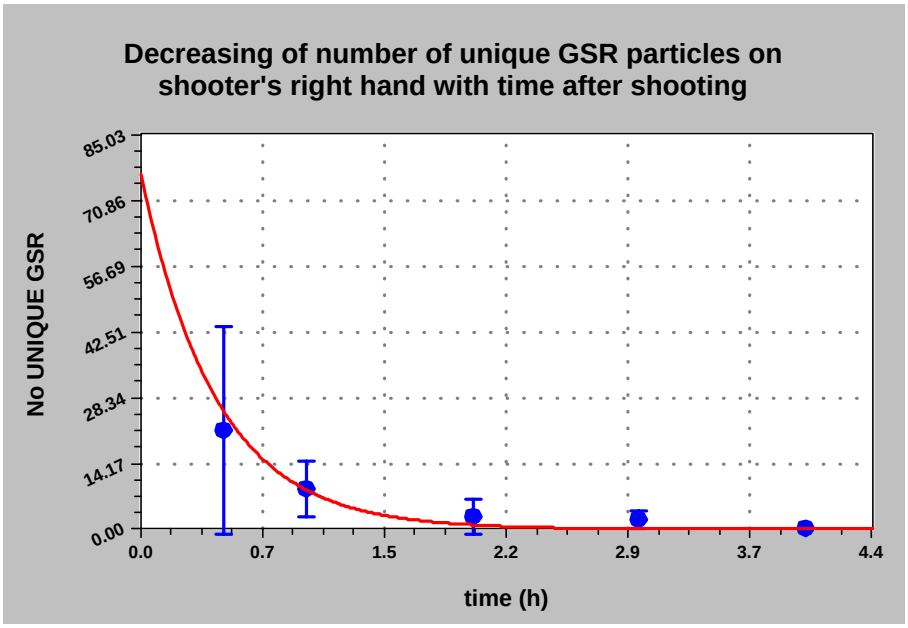

It requires a very unusual mind to undertake the analysis of the obvious.

Alfred North Whitehead (1861-1947) English philosopher and mathematician

GSR ANALYSIS in LV and ESEM MODE

GSR analysis in LV and ESEM mode is divided in several topics:

- **Influence of hand cream on GSR particle detection:** in order to determine whether hand cream has any influence on GSR particle detection the following experiment was conducted. First, the shooter would carefully wash his hands, put a lot of hand cream on his dry hands and finally shoot one shot from 9x19 mm pistol. Later, the same person would first wash his hands then shoot and finally put a lot of hand cream on his hands. In both cases, the pistol would be carefully cleaned before shooting and sampling of hands was performed immediately after shooting. Adhesive tapes used were heavily soiled with hand cream and it would be impossible to analyze the tapes in high vacuum because of high charging effect. Instead, tapes had been analyzed in LV mode (~1.0 Torr). Surprisingly, it showed that the heavy layer of hand cream had no effect at all on GSR on hands.
- **Influence of blood on GSR particle detection:** interference of blood on GSR particle detection was expected. Some articles had been speaking about this problem due to high content of lead in blood, which would cause interference. To explore this difficulty, two types of experiments were conducted imitating real case situation of bloody hands of a shooter. In the first part of experiment, the shooter's hands without blood were taped and after that dry blood from real case garment was inserted on the tape. Small fragments of dry blood could be easily seen under an optical microscope. The tape was then submitted for automated

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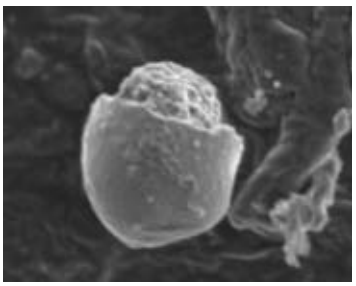

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Forensic Application of an ESEM...*Continued*

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GSR analysis which managed to find a large number of GSR particles on the tape except on the parts of a tape covered with dry particles of blood. The same was observed with small fresh drop of blood from laboratory. After drying the blood, an automated GSR analysis was performed. Results were the same as before. Obviously, the layer of blood was too deep for primary electron beam and even with 30.0 kV accelerating voltage it was not possible to reach GSR particles. It was also noted that there is no interference of blood in a sense that high content of lead in blood would disable GSR analysis. Blood interference is passive in nature. Practically, this means that those bloody areas on skin and garments should be carefully avoided during sampling.

- **GSR analysis directly on textile:** ESEM mode allows us to perform GSR analysis directly on textile (garment) without any pretreatment (coating). GSR particles positioned on the outer layer of a textile in the vicinity of the entrance hole of a bullet were analyzed by cutting of piece of the garment and inserting inside the chamber of ESEM. BSE imaging and EDX analysis of GSR particles was performed without problem. After manual search, "bright" particles could be detected and manual EDX analysis identified as GSR particles.
- **Detection of entrance/exit hole of a bullet on a garment:** although direct GSR analysis on a garment (as well as on other materials like wood, cement, ceramic, rock, glass, etc.) was no problem for ESEM, nondestructive method should be favorable. Also, it is easier and more convenient to tape the garment and analyze the tape. Depending on the sample, tape may not have high collecting efficiency but sometimes it is more important not to change the sample and to analyze it indirectly by use of transfer media (tape). If it shows not to be enough, we can always analyze it directly by cutting and inserting a piece of sample inside the chamber. Many experiments were conducted in such a way that a circular area of 10 cm in diameter around entrance and exit hole of a bullet on the garment were systematically taped and the tape analyzed by automated GSR. Results for entrance/exit hole were always compared to related results for control sample. This method gave unquestionable results regarding entrance/exit bullet hole conclusions. The same results were even seen after GSR analysis around the entrance of the bullet hole was analyzed using the Walker test which had yielded a negative result. It turned out that searching for nitrites and heavily soiling of the garment with alfanaftylamin, sulfanyl and acetic acid seemed to have no influence on GSR analysis at all.
- **Automated GSR analysis on nonconductive adhesive tape from an old Firearms Residue Kit-DEMO of Metropolitan Police Forensic Science Laboratory:** Instead of small circular carbon tapes (12.5 mm in diameter) mounted on aluminum stubs, colleagues in London use big flexible strips of adhesive tape. Flexible strips have an advantage during taping curved areas but have a disadvantage that they are not conductive, so they need coating. ESEM allows us to work with nonconductive samples, so we taped a shooter's hand with the tape from the Kit, inserted the uncoated tape inside the chamber of the ESEM, and ran an automated GSR analysis without any problem. After that we tried similar experiments with other types of adhesive tapes and couldn't report any problems.

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Forensic Science Organizations

American Academy of Forensic Sciences (AAFS)
http://www.aafs.org/ Forensic Science

ASCLD : American Society of Crime Lab Directors
http://www.ascld.org/

Association for Crime Scene Reconstruction
http://www.acsr.org/

Australian & New Zealand Forensic Science Society
http://www.nifs.com.au/ ANZFSS/ANZFSS.html

California Association of Criminalists
http://www.cacnews.org/

Canadian Society of Forensic Sciences
http://www.csfs.ca/

ENFSI : European Network of Forensic Institutes
http://www.enfsi.org/

International Association for Identification (IAI)
http://www.theiai.org

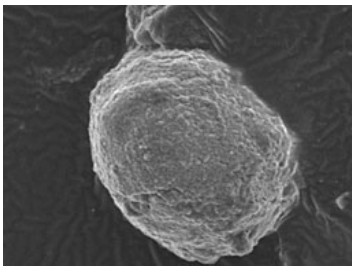
Association of Firearm and Toolmark Examiners
http://www.afte.org/

Southwestern Association of Forensic Scienctists
http://www.swafs.org/

Midwestern Association of Forensic Scientists
http://mafs.net/

The Forensic Science Society
http://www.forensic-science-society.org.uk/

Forensic SEM Discussion Group-*Follow Up*



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Recently we began a list-serve to satisfy the need for communication among laboratories performing SEM in the Forensic discipline. We decided to use the "Yahoo E-groups" mail utility, since this Yahoo provides many list-serve features, it is very easy to use, and best of all – it is free! We established it with maximum security – it is not listed in the Yahoo directory, and membership is restricted to those very closely aligned with criminal justice process - primarily government Forensic laboratories. Within these restrictions, all members have access to all of the features. Begun in November, 2001, we now have 180 members representing about 130 individual laboratories worldwide.

Although the list-serve encourages posts regarding ALL SEM/EDS related topics, most of the conversations thus far have related to GSR. There has been an interesting assortment of topics to date, including methods, instrumentation, and interpretations.

We have been trying to invite every individual that is either actively involved or interested in SEM. Unfortunately this effort has been slowed by "real world" time constraints of the moderator as well existing mailing lists that do not include email addresses.

If you are not subscribed, but feel you should communicate or listen to "all you ever wanted to know about GSR" issues, then please contact me as the list-serve moderator, and I will subscribe you. Again, unfortunately, this membership is restricted to those directly involved with Forensic issues.

See you on-line!

Dennis Ward, FBI
DCWard@concentric.net

It is a capital mistake to theorise before one has data. Insensibly one begins to twist facts to suit theories instead of theories to suit facts.

Sherlock Holmes, the fictional creation of Arthur Conan Doyle (1859-1930) British physician and novelist

Notes from the AAFS GSR Meeting

An impromptu GSR meeting was held at the American Academy of Forensic Science convention in Atlanta on 13 February 2002. Mike Trimpe used the Yahoo Forensic SEM users group to suggest the meeting. If you wish to join this group, contact Dennis Ward at DCWard@concentric.net.

ATTENDEES: Mike Trimpe, Hamilton County Coroner's Laboratory, Ohio; Dan Van Gelder, Baltimore PD Laboratory; Bob Clemmens, Georgia Bureau of Investigation Laboratory; Elizabeth Ziolkowski, Boston PD Laboratory; Lee Fadness and David Flohr, United States Army Criminal Investigation Laboratory.

- Mike Trimpe gave a PowerPoint presentation on the analysis of fireworks residues.
- Mike did not find Pb/Ba/Sb particles in the combustion products from commercially available fireworks. He did find Pb/Ba and Pb/Sb particles.
- Magnalium (a Mg/Al alloy) is commonly used in fireworks. Therefore, fireworks residues often have high levels of Mg while primer particles do not.
- The book "Wizards of Pyrotechnic Formulary" is a good source for chemical compositions of fireworks. Of the 2417 formulations listed in this book, 25% contain Sb, 9.5% contain Ba, 2.4% contain Pb, 2% contain Ba/Sb, 0.5% contain Pb/Ba, and 0.1% contain Pb/Sb. Only one formulation contains Pb/Ba/Sb.
- The case information sheets provided in the SEM/GSR kits used by the Ohio system include a block that asks "Have you handled, used, or been around fireworks residue recently?" Only one case sheet has ever been marked in the affirmative for this question.

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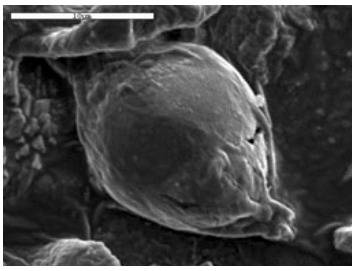

Lead, Barium and Antimony
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Notes from the AAFS GSR Meeting-*Continued*

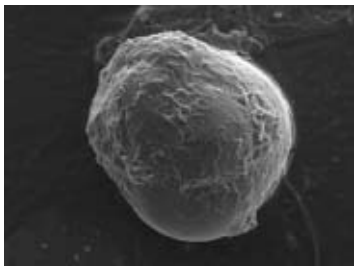
(Continued from page 8)

- The Centre of Forensic Sciences includes a "Gunshot Residue Information" sheet with all of their GSR reports. This sheet includes the statement "Some pyrotechnic devices, if they contain all of the elements lead, barium and antimony, may generate particles similar in size range and composition to GSR." This sheet includes information on GSR under the headings of "Introduction", "Examination", "Interpretation", and "Glossary".
- The article "Gunshot Residue-Similar Particles Produced by Fireworks" from the Canadian Society of Forensic Science Journal, Vol. 31, No. 3, (1998) pp 157-168 was discussed.
- The ASTM standard E 1588, "Standard Guide for Gunshot Residue Analysis by Scanning Electron Microscopy/Energy Dispersive X-ray Spectroscopy" was discussed. A revision of this standard was recently written and voted on. It did not pass. Two problems with the revision include the lack of definitions for the words "characteristic" and "indicative", and a list of elements allowed to be present in GSR which implies a list of "forbidden" elements, some of which do, in fact, occur in GSR.
- Of the laboratories represented, three are currently analyzing GSR by SEM/EDS. One lab reports the presence of GSR based on finding Ba/Sb particles if other "odd" particles are not found. One laboratory reports the presence of GSR only if Pb/Ba/Sb particles are present. One laboratory will report the presence of Pb/Sb and Pb/Ba particles as characteristic but not unique to GSR.
- John Giacalone of the West Virginia Laboratory has done some work on GSR-similar particles found on brakes. We attempted to view a PowerPoint presentation detailing his findings, but were unable to load it.
- Of the three laboratories analyzing GSR by SEM/EDS, two perform analyses on samples collected from clothing. One laboratory will not analyze collections from clothing since "…there is no way of knowing how long the residue, if present, has been on the clothing."
- Mike Trimpe presented a PowerPoint presentation on "The Top Ten Reasons for Finding and Not Finding GSR". Mike uses this presentation for training purposes.
- In order to prevent contamination and loss of particles, the Baltimore police bag the hands of suspects with Tyvek bags. These bags have string ties so they can be secured around suspect's wrists.
- Mike Trimpe said that that he no longer analyzes the inside of bags used to protect suspected shooter's hands because he has never found GSR in the bags unless it was also present on the hand stubs.

We suggest that, if there is sufficient interest, such meetings of GSR examiners be held in the future at both national and regional forensic conferences.

GSR discussion notes summarized by:

Lee Fadness & David Flohr
U.S. Army Criminal Investigation Laboratory



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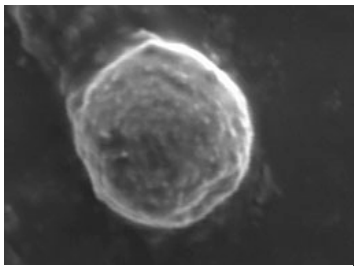
All of physics is either impossible or trivial. It is impossible until you understand it, and then it becomes trivial.

Ernest Rutherford (1st Baron Rutherford of Nelson) (1871- 1937) English physicist, born in New Zealand. Nobel prize for chemistry 1908



Lead and Barium
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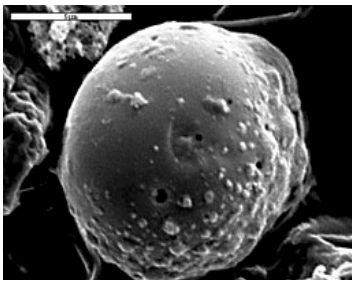
NEW- GSR Surface Collection Kit



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IAMA is proud to introduce the new SEM Surface Collection Gunshot Residue Kit developed by Michael Martinez of the Bexar County Criminal Investigation Laboratory, and Jay Walker of Tri-Tech, Inc.

Since more and more agencies are routinely collecting Gunshot Residue from surfaces other than a suspected shooter's hands, we have developed a Surface Collection Gunshot Residue Kit. This kit is designed to simplify collections in the field and to assure that the crime laboratory receives GSR samples that are clearly identifiable, (i.e. collected from table top, dashboard, door frame, car seat or clothing.)

The vials holding the SEM mounts are labeled Sample Number 1, 2, 3 and 4, and each vial label has a write-on area to indicate where the sample was collected, (i.e. door frame). In addition, the GSR Analysis Information Form requests a more detailed description of where the sample was collected, along with other information to assist the analyst.

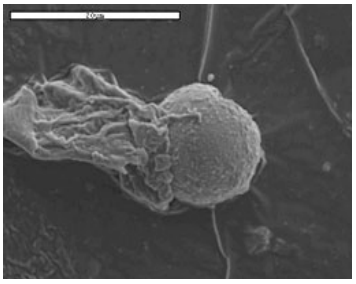
The Surface Collection Gunshot Residue Kits are available with 3 different SEM mounts, "C" Mount, "D" Mount and "Q" Mount.

The newly designed kits are exclusively distributed by:

Tri-Tech, Inc.
4019 Executive Park Blvd., SE
Southport, NC 28461
(800) 438-7884 phone
(910) 457-0094 fax
http://www.tritechusa.com
E-mail: tritech@tritechusa.com

There are in fact two things, science and opinion; the former begets knowledge, the latter ignorance.

Hippocrates (c460-c.377 BCE) Greek physician. Law



Lead, Barium and Antimony
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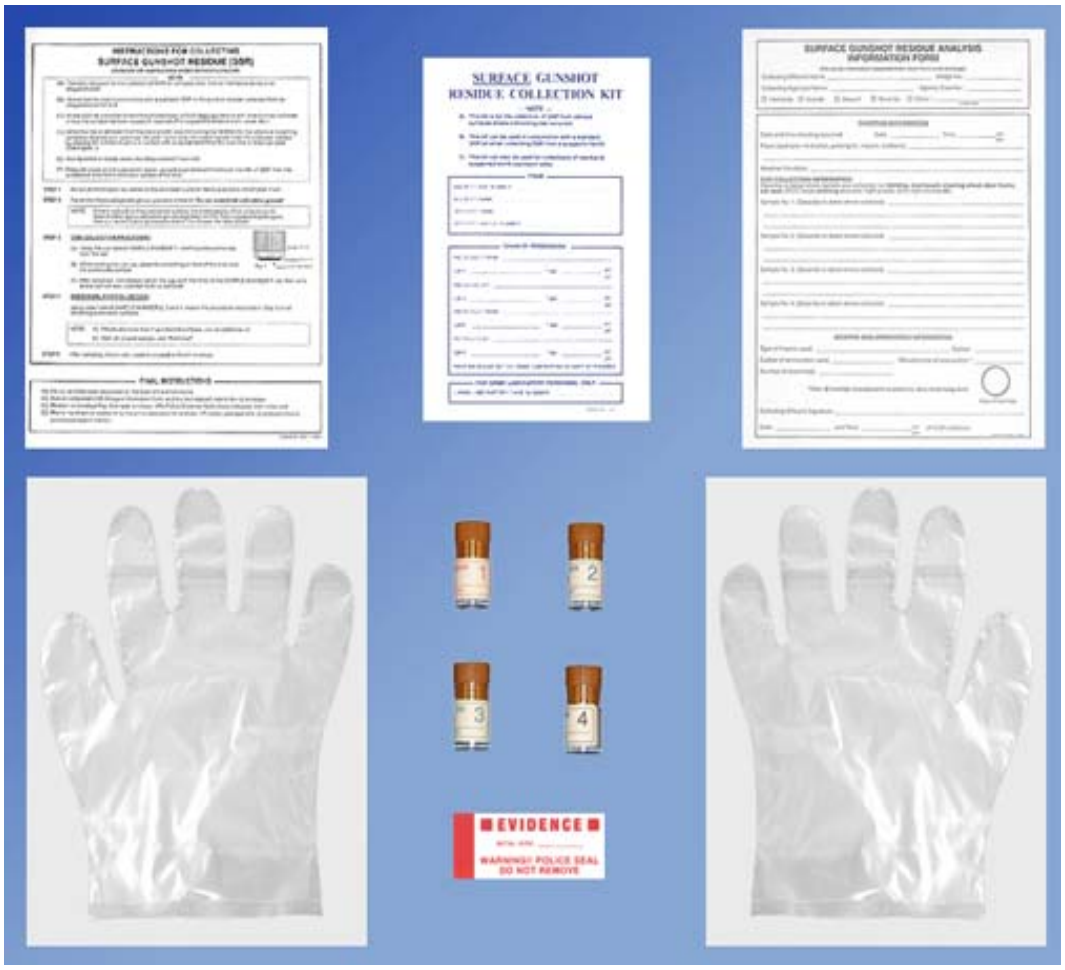
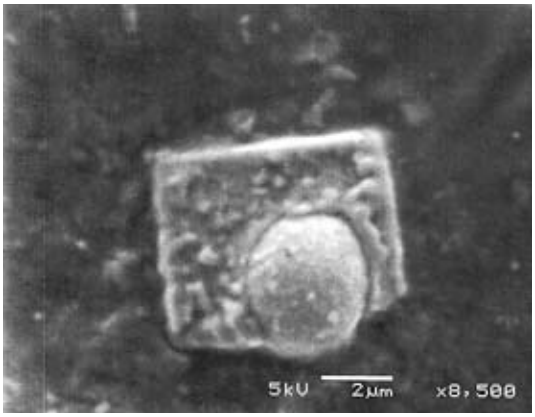


Unusual Primer Gunshot Residue Particle



In recent years, many Forensic Scientists have attempted to identify additional Trace elements associated with primer gunshot residue. In a criminal case that I worked several years ago, a very unlikely element was found associated with a P-GSR particle. Using the automated P-GSR detection software by Oxford Instruments, a positive identification was made on a spherical P-GSR particle composed of lead, barium and antimony embedded in NaCl (salt).

Additional inquiries into this case revealed that the subject, from whom the gunshot residue collection kit was taken, went to a bar located in a south Texas border town to collect money owed to him from several patrons in the establishment. After indulging in a few shots of Tequila, the subject began firing on his debtors. Unfortunately, most of the patrons in this establishment were well-armed, and after a gun battle reminiscent of the Old West, the subject was shot several times and found dead a few yards from his vehicle. It would be reasonable to assume that the subject preferred salt with his Tequila shooter.

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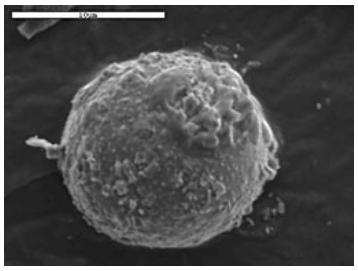

Lead, Barium and Antimony
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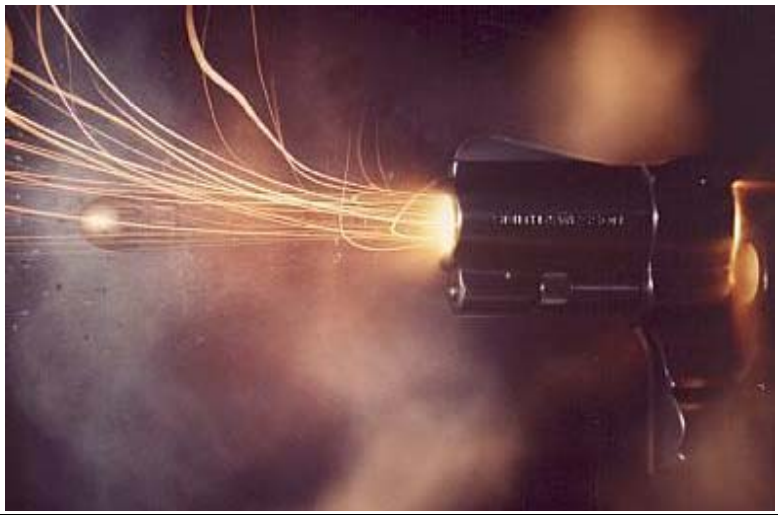
If your experiment needs statistics, then you ought to have done a better experiment.

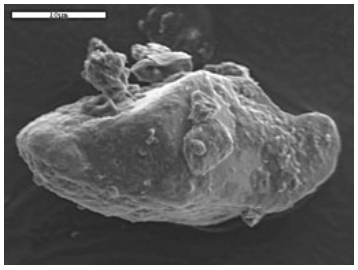
Ernest Rutherford (1st Baron Rutherford of Nelson) (1871- 1937) English physicist, born in New Zealand. Nobel prize for chemistry 1908

FYI!

A reminder of upcoming events:

Oxford Instruments is holding an ISIS Gunshot users meeting on **June 4th and 5th, 2002** at Oxford Instruments' USA Laboratory in Concord, Massachusetts. The aim of this meeting is to provide a forum for users to meet and discuss various aspects of gunshot residue analysis by SEM/EDS. For additional information, please contact Richard McLaughlin at (978) 369-9933.





Lead, Barium and Antimony
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